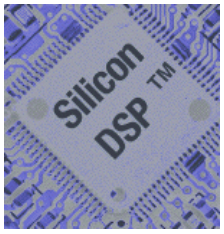
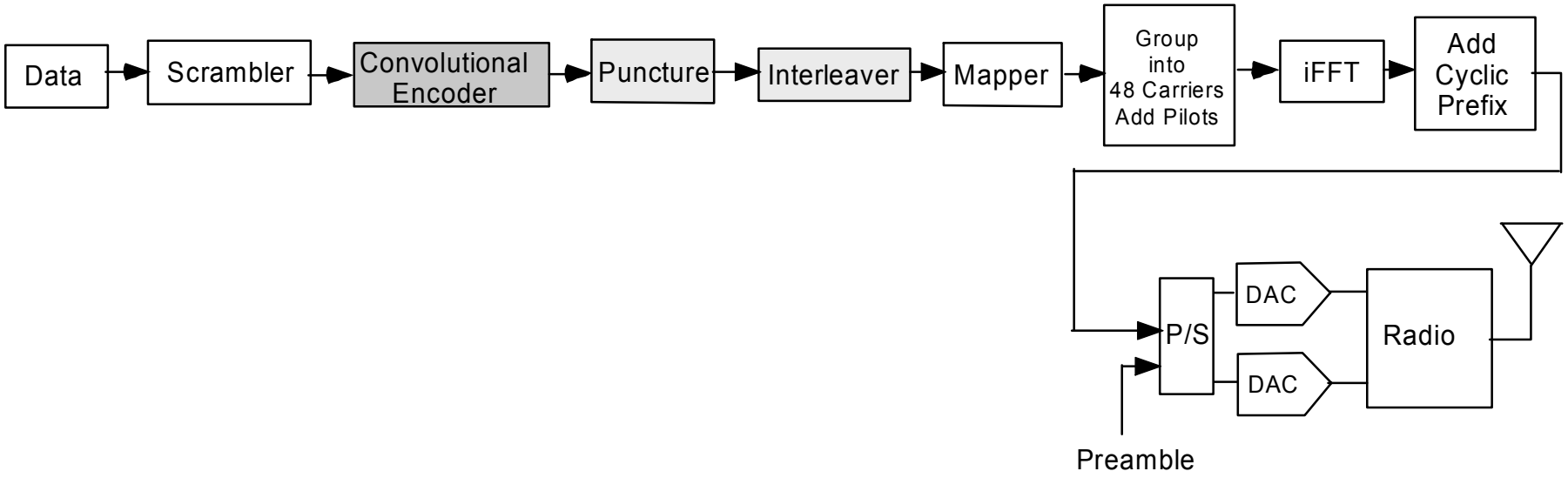
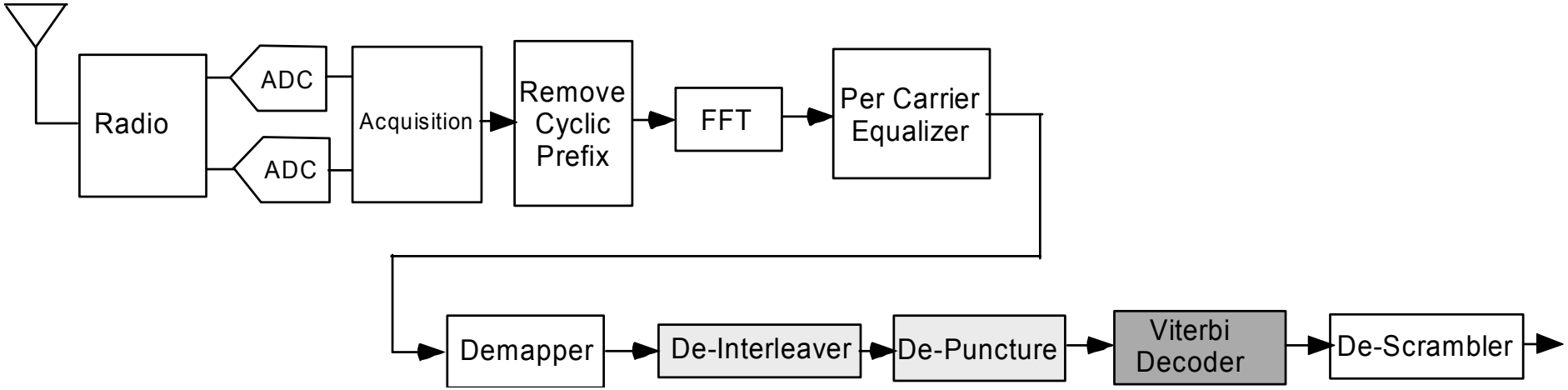
Interleaving

Combating Fading When Combined with FEC

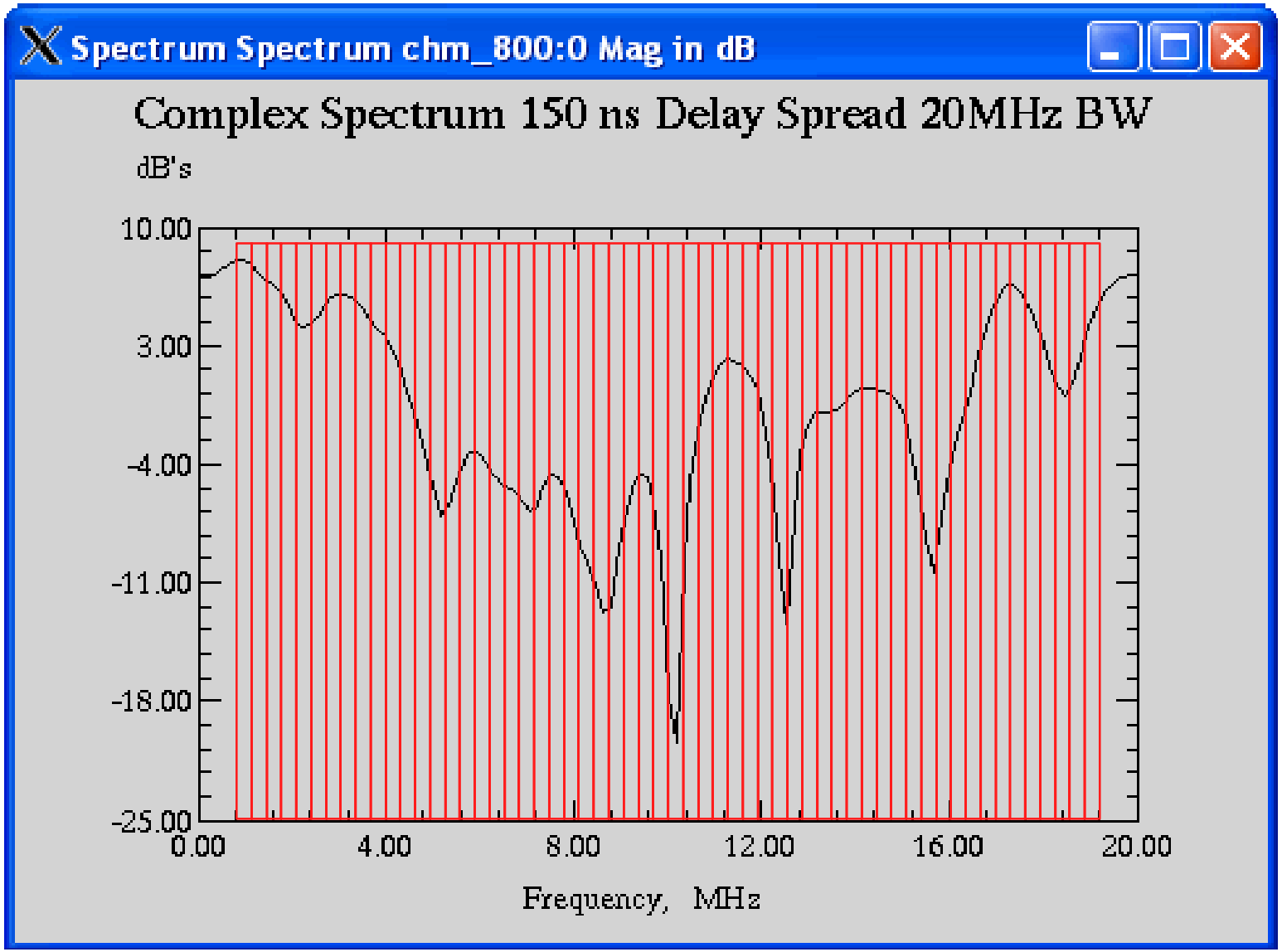


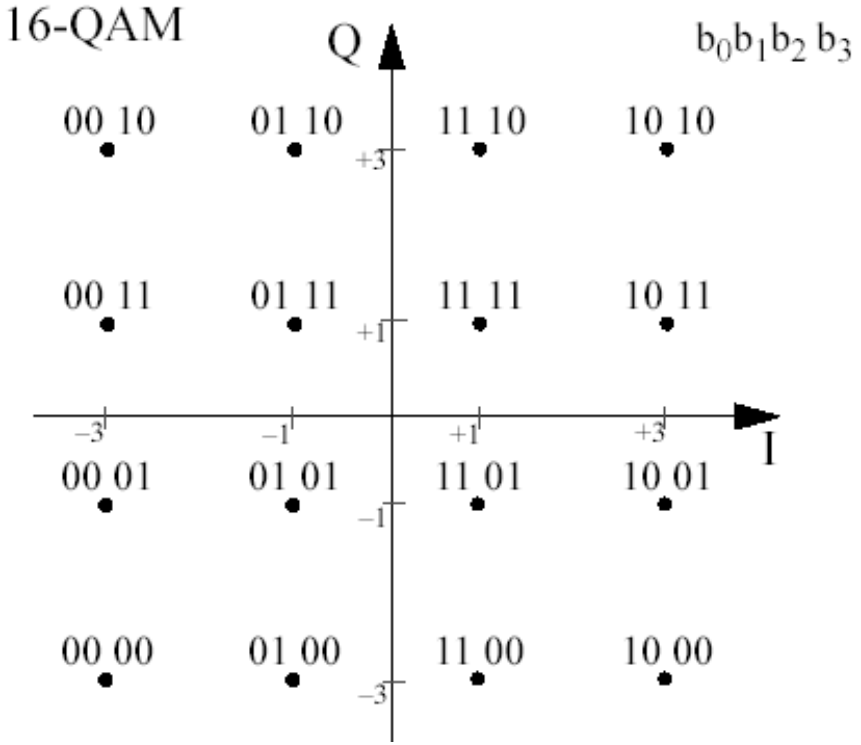
Silicon DSP Corporation

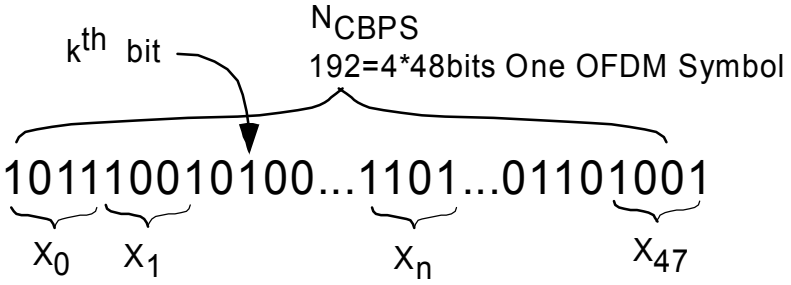




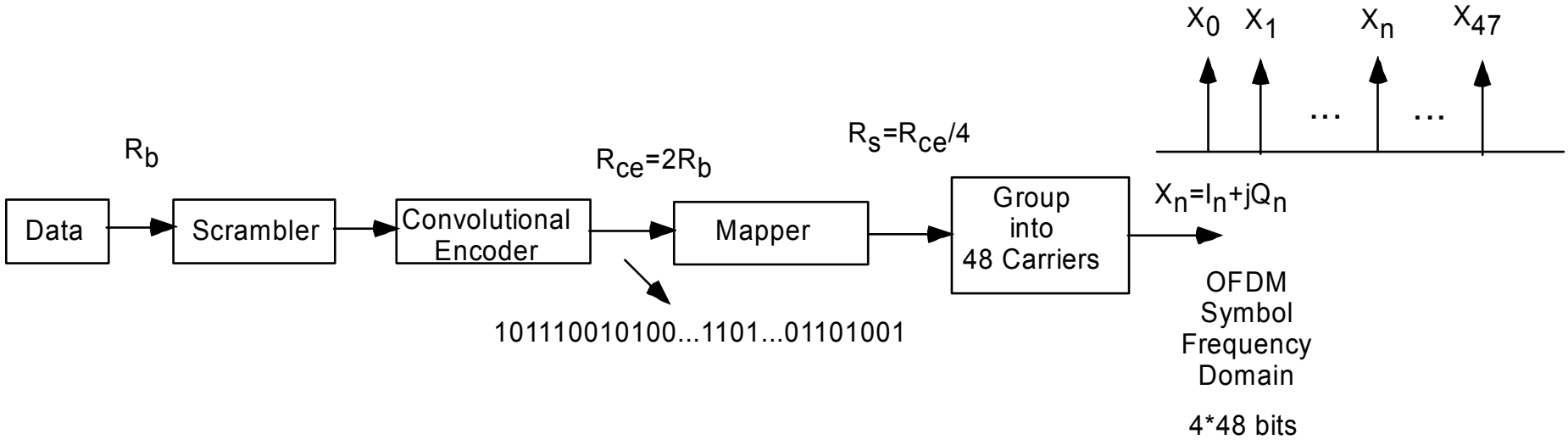
Background

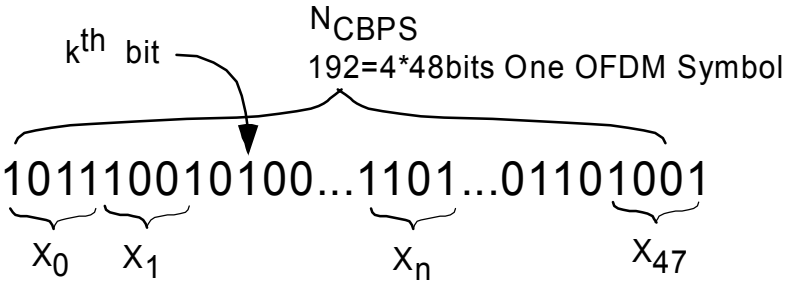


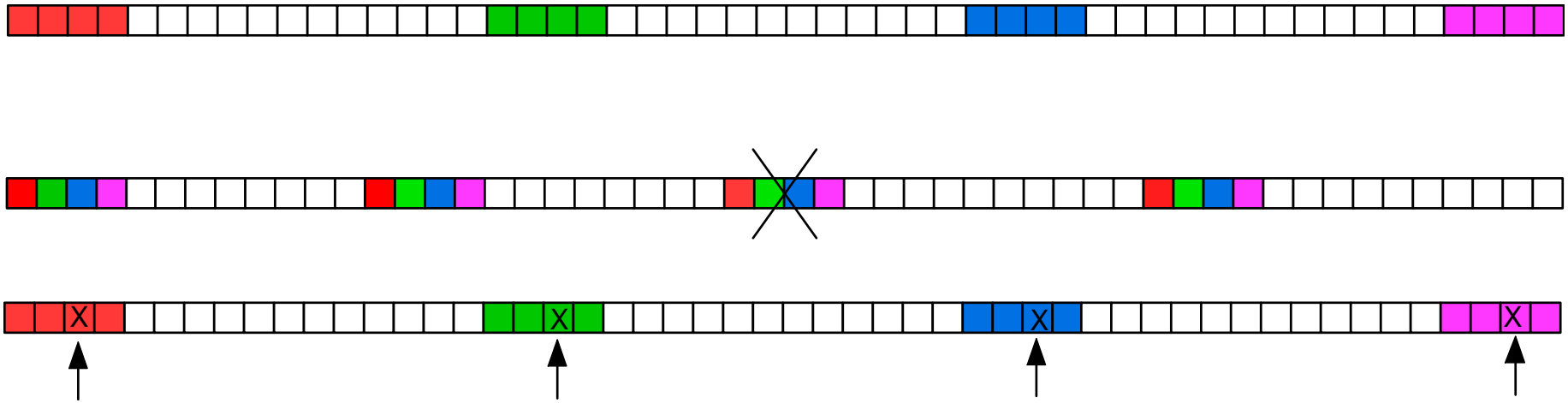




$$k = 0,1,\ldots,N_{CBPS} - 1$$







802.11a Interleaving Scheme

- block interleaver with a block size corresponding to the number of bits in a single OFDM symbol, N_{CBPS}.
- Two-step permutation.
  - First permutation ensures that adjacent coded bits are mapped onto ***nonadjacent*** subcarriers.
  - The second ensures that adjacent coded bits are mapped alternately onto less and more significant bits of the constellation and,thereby, long runs of low reliability (LSB) bits are avoided.

First Permutation

$$i = (N_{CBPS}/16)\,(k \bmod 16) + \text{floor}(k/16) \qquad k = 0,1,\ldots,N_{CBPS}-1$$

For 16 QAM N_{CBPS}=192

$$i = \underbrace{(N_{CBPS}/16)}_{12}\,(k \bmod 16) + \text{floor}(k/16)$$

Second Permutation

Number of Coded Bits per Subcarrier,

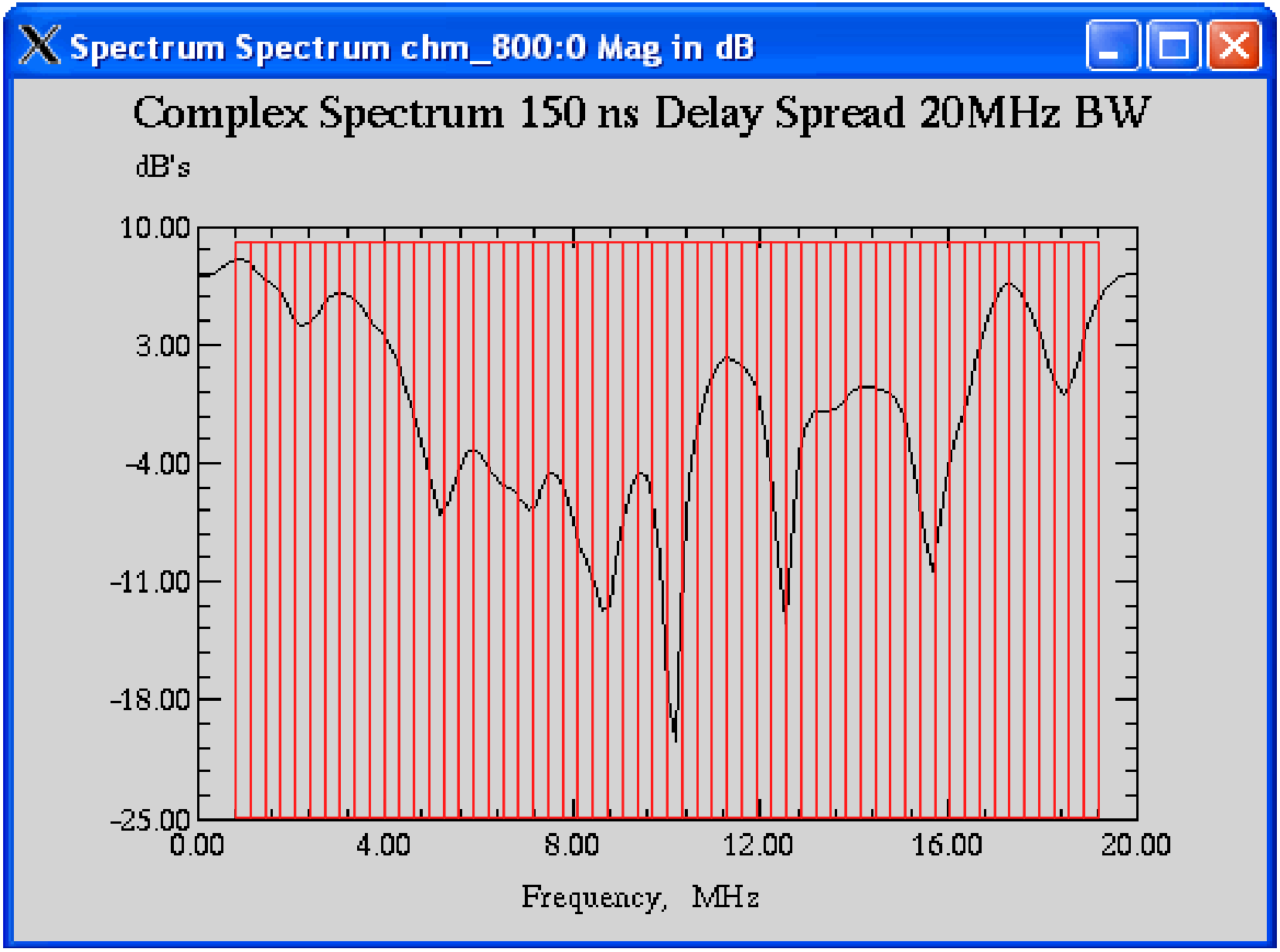
N_{BPSC}

$$s = \max(N_{BPSC}/2, 1)$$

$$j = s \times \text{floor}(i/s) + (i + N_{CBPS} - \text{floor}(16 \times i/N_{CBPS})) \bmod s \qquad i = 0,1,\ldots N_{CBPS} - 1$$

Interleaver Example

k	i	j	k	i	j
0	0	0	167	94	95
1	12	13	168	106	106
2	24	24	169	118	119
3	36	37	170	130	130
4	48	48	171	142	143
5	60	61	172	154	154
6	72	72	173	166	167
7	84	85	174	178	178
8	96	96	175	190	191
9	108	109	176	11	11
10	120	120	177	23	22
11	132	133	178	35	35
12	144	144	179	47	46
13	156	157	180	59	59
14	168	168	181	71	70
15	180	181	182	83	83
16	1	1	183	95	94
17	13	12	184	107	107
18	25	25	185	119	118
19	37	36	186	131	131
20	49	49	187	143	142
21	61	60	188	155	155
22	73	73	189	167	166
23	85	84	190	179	179
24	97	97	191	191	190



0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
1
13
25
37
49
61
73
85